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**MULTI-POSITIONAL SEAT**

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**MULTI-POSITIONAL SEAT**

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The present invention relates generally to seats in vehicles for traveling, and more particularly to reclining seats in vehicles for traveling.

10 **BACKGROUND OF THE INVENTION**

Some previous seats utilized in buses, airplanes and other vehicles allow a person using the seat to position themselves in one of two positions, up-right or reclined. These two positions may provide some comfort for a limited 15 period of time. However, over longer periods of time users become uncomfortable in these limited positions.

Further, previous seats in airplanes and buses that allow a user to recline interfere with other passenger's space. The reclining of the seat causes the head back rest 20 to recline back towards and into the space of the person behind the reclined seat. This reduces the space of the person behind. Therefore, the reclining of the seat interferes with the person behind and further limits the amount that the seat can recline.

25 The present invention advantageously addresses the above and other needs.

## SUMMARY OF THE INVENTION

The present invention advantageously addresses the needs above as well as other needs by providing an apparatus for use in sitting in vehicles and a method for use in the production of a seat. In one embodiment, the apparatus includes a base fixed to a vehicle, a seat pan moveably secured with the base and a back rest moveably secured with the base. The seat pan includes a first portion and a second portion, wherein the first portion is rotationally secured relative to the second portion, such that the first portion can be rotationally positioned in a plurality of positions relative to the second portion.

In one embodiment, the present invention provides an apparatus for use in sitting. The apparatus includes a base, a back secured with the base and a seat pan secured with the base. The seat pan includes a first portion and a second portion, wherein the first portion is configured to pivot relative to the second portion, such that the first portion of the seat pan pivots allowing a distal end of the first portion positioned away from the second portion to pivot so that the distal end can be moved out of a relative alignment with the second portion.

In an alternative embodiment, the present invention provides a method for use in manufacturing a seat, including pivotably securing a first portion of a seat pan with a base, movably securing a second portion of the seat pan with the base proximate the first portion, wherein the second portion is movably secured such that the second portion of the seat pan moves along an axis, securing a back frame with the base, and slidably securing a back rest

with the back frame such that a lower portion of the back rest pivots as the second portion of the seat pan is moved along the axis.

A better understanding of the features and  
5 advantages of the present invention will be obtained by  
reference to the following detailed description of the  
invention and accompanying drawings, which set forth  
illustrative embodiments in which the principles of the  
invention are utilized.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects, features and advantages  
of the present invention will be more apparent from the  
following more particular description thereof, presented in  
15 conjunction with the following drawings wherein:

FIGS. 1 and 2 depict simplified, plane cross-  
sectional views of a multi-positional seat that can be  
utilized in vehicles according to one embodiment of the  
present invention;

20 FIG. 3 depicts a simplified cross-sectional block  
diagram of a plurality of aligned seats;

FIG. 4 depicts a simplified cross-sectional, block  
diagram of the multi-positional seat similar to that shown  
in FIGS. 1-3 with the seat in alternative positions;

25 FIG. 5 depicts a simplified cross-sectional, block  
diagram of two multi-positional seats according to  
embodiments of the present invention; and

FIGS. 6 and 7 depict simplified schematic diagrams  
of a seat frame according to one embodiment of the present  
30 invention that can be utilized in the seats shown in FIGS.  
1-5.

Corresponding reference characters indicate corresponding components throughout the several views of the drawings.

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#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Previous seats utilized in airplanes, buses and other vehicles for traveling only provide a person using the seat limited comfort and positioning. Some previous 10 seats are fixed in a single position that limits the user to that single position. Other previous seats allow the user to recline an upper portion of a back rest in an attempt to allow the user to recline. As such, these previous seats allow the user to be in an up-right position 15 or a reclined position. These positions may provide some comfort for short durations of time. However, over longer periods of time, a user becomes uncomfortable in these limited positions.

The present invention provides a multi-positional 20 seat that allows a user to position him or herself in any one of several different positions. This provides the user with the ability to be positioned in any number of comfortable positions.

Another problem with previous reclining seats in 25 airplanes, buses and other vehicles is that the reclining causes the head portion or head rest of the seat to move back towards and into the space of the person behind the reclined seat. This reduces the space of the person behind. Therefore, the reclining of the seat interferes 30 with the person behind and further limits the amount that the seat can recline because the seat cannot extend or

encroach too far into the space of the person behind.

Alternatively, the present invention provides for a seat that reclines without encroaching or minimally encroaching into the space of the person behind.

FIGS. 1 and 2 depict simplified plane, cross-sectional views of a multi-positional seat 120 that can be utilized in a plane, bus or other vehicle according to one embodiment of the present invention. The seats 120 are configured to allow the person seated in the seat (user) to shift the position of the seat to any one of a plurality of different positions. For example, the user can shift the seat pan 122 and the lower portion 132 of the back rest 130 generally horizontal (indicated by the arrow labeled 140) reclining the seat (see FIG. 2). Because the seat pan 122 and lower portion 132 of the back rest move forward and back and because the pivot point is at the top of the back rest, the head rest 134 does not move back or minimally moves back into the space of the person behind.

FIG. 2 shows the multi-positional seat 120 of FIG. 1 in a reclined position. The seat pan and back rest are in a forward position. In one embodiment, the seat pan 122 is configured as a split seat pan with a plurality of seat pan portions. For example, the split seat pan 122 can include a front portion 124 and a rear portion 126. The seat pan is configured to allow the front portion 124 to drop down or flip up as the seat pan 122 and lower portion 132 of the back rest are shifted forward. With the front portion 124 of the seat pan dropped, the user can incline his or her legs, particularly the upper legs, at a greater angle than could be achieved with previous seats. With front portion 124 flipped up, a user can sit on the forward edge of the

front portion to elevate the user.

Because the person sitting in the seat 120 can stretch his/her legs at a greater angle, the person can more easily extend his/her legs under the seat in front of 5 them. This allows the user to achieve an even greater reclined position without intruding on the person behind.

The back rest 130 is slidably or moveably secured to a frame 138 at a first recline pivot point 136. The back rest 130 pivots about the recline pivot point 136. The 10 pivot point 136 is positioned in an upper portion of the back rest near the head rest 134. This allows the lower portion 132 of the back rest 130 to pivot or swing forward while limiting or preventing the head rest from shifting back.

15 FIG. 3 depicts a simplified cross-sectional block diagram of a plurality of aligned seats 161-167. A first set 170 shows a series of seats 161-163 in an up-right and non-reclined position. A second set 172 shows a series of seats 164-167 with two of the seats 164 and 166 in an up-right and non-reclined position, and two seats 165 and 167 20 in a reclined position. As described above the seat pan 122 and lower portion 132 of the back rest 130 of the reclined seat 165 shifts generally horizontally relative to the floor to which the seat is typically secured (indicated 25 by arrow labeled 140). This reclines the back rest 130. However, the head rest 134 does not move back or minimally moves back into the space of the person behind (indicated with a dotted enclosure labeled 174).

30 The seat pan 122 includes the front portion 124 and the rear portion 126. In an up-right position the front and rear portions are typically in relative alignment

allowing someone to sit on the seat pan. The reclined seat 165 is shown with the front portion 124 pivoted or dropped out of alignment with the rear portion 126. This allows the upper portion of the user's legs 182 to be positioned at

5 an angle  $\theta$  that is greater than would otherwise be possible. The greater angle provides the user 180 with more options in positioning himself or herself. Further, allowing the user to drop his or her upper legs at a greater angle allows the user to extend their legs toward,

10 and typically under the seat in front (in this example, seat labeled 164) to achieve a more reclined position.

A person using a previous seat could attempt to achieve this angle of extension with their legs only by slouching or scooting forward on the seat pan. However,

15 this is often prevented because the person's knees contact the seat in front before achieving the extended angle  $\theta$ . Further, the user loses back support when slouched or sitting forward in the seat pan which quickly becomes uncomfortable.

20 As such, the present invention allows an individual sitting in a seat to recline the seat without reducing the space of the person behind. Further, the present invention allows the person to recline and extend their legs at a greater angle than was available in previous seats.

25 Because the seat pan 122 and lower portion 132 of the back rest 130 move forward and the front portion 124 of the seat pan drops, the person sitting in the reclined seat can achieve a reclined position at least similar to and typically greater than positions achieved in previous

30 seats, without reducing the space 174 of the person behind.

The seat pan 122 can also be moved forward while

keeping the front portion 124 in a position aligned with the rear portion 126. The fourth seat 167 shows the seat in a reclined position with the seat pan 122 and lower portion 132 of the back rest 130 moved forward. The front 5 portion 124 is maintained in a position relatively aligned with the rear portion 126. This provides the user 180 with support for the upper part of their legs 182 and provides another position for the user.

FIG. 4 depicts simplified, cross-sectional, block 10 diagrams of the multi-positional seat 220 similar to that shown in FIGS. 1-3 with the seat in alternative positions. The seat pan 222 of the seat 220 includes multiple 15 portions, such as a front portion 224 and a rear portion 226. The front portion 224 can be pivoted or shifted into an inverse or elevated position such that at least some of the front portion at a distal end extends above the rear portion 226. This allows the user to sit on a front or distal edge 227 of the front portion 224 of the seat. Sitting on the front edge allows the user to position 20 him/herself in an elevated or perched position. This position provides the user with another alterative position in which to sit and get comfortable.

Further, this perched position can be advantageous 25 for shorter users or children to see over the seat in front, for example for watching a movie. In some embodiments, the front portion 224 is pivoted around on top of the rear portion 226 allowing the user to sit on an under side of the front portion 224 of the seat pan 220 providing a wider seat area on which to perch.

30 Still referring to FIG. 4, when the seat 220 is configured to allow the front portion 224 of the seat pan

222 to swing up, a cushioning 228 of the front portion 224  
is provided, and is some embodiments wraps at least  
partially around to the under side 229 of the front portion  
224. In this configuration, a life vest 240 or other  
5 flotation device can be secured within the portion of the  
under side 229 without the cushioning 228.  
Allowing the front portion 224 to swing up provides  
additional space between the seat 220 and a seat directly  
in front. The additional space aids in entering and  
leaving seats. Further, a person can lift the front  
10 portion and stand in front of the folded portion allowing  
additional space for another passenger to get by when  
entering or departing a row of seats.  
The multi-positional seat 120, 220 is further  
15 configured to provide safety during a crash of the vehicle  
in which the seat is secured. FIG. 5 depicts simplified  
cross-sectional, block diagrams of two multi-positional  
seats 257, 258 according to one embodiment of the present  
invention. In one embodiment, the back rest 230 is further  
20 secured with a frame 260 at a forward crash pivot point  
250. In addition to the reclining pivot 250 such that the upper or  
head rest portion of the back rest 230 is further  
25 secured with a floor 270 of an airplane, bus or other  
portion 262 and a back portion 264. The base portion is  
secured with a base portion 262. When a force exceeding a predefined  
threshold is applied to the back 230 or frame 264, the back  
30 rest 230 and back portion 264 of the frame pivots. The

pivoting reduces potential injury to someone hitting the seat during a crash, and limits damage to the seat and flooring. In some embodiments, the crash pivot 250 can be the same pivot as employed to secure the lower portion of 5 the back rest with the rear portion of the seat pan to allow the lower portion to swing forward.

Still referring to FIG. 5, a first seat 257 of two seats 257 and 258 is depicted in a normal up-right position. The second seat 258 shows the seat after a 10 forward force (indicated by the arrow labeled 263) is applied to the seat 258. When the force 263 exceeds a predefined level, the frame 262 and back 230 pivot at the crash pivot 250. The crash pivot provides added safety for passengers and helps to prevent the frame 136 from being 15 dislodged from the mountings in the floor of the airplane, bus or other vehicle.

The seat according to the present invention additionally makes it easier for passengers to get into and out of seats. Frequently, airplanes, buses and other 20 vehicles secure a plurality of seats in a row. As such, passengers must often pass one or more seats to get to their seat within the row. Because the seat pan of the present invention is configured with a plurality of portions, the front portion can be pivoted out of the way 25 (up or down) to increase passage space easing ingress and egress to and from seats. This also provides for an added safety feature. By easing the egress, passengers can more easily get out of their seat rows and to exit doors in emergency situations.

30 FIGS. 6 and 7 depict simplified, cross-sectional diagrams of a seat frame 420 according to one embodiment of

the present invention. The seat includes a base 422 that is secured to a vehicle, such as the floor of the passenger compartment of an airplane. The seat frame 420 includes a seat pan frame 424 and a back or back rest frame 426. The 5 seat pan and back rest frame are moveably secured with the base 422 to allow the seat pan frame 424 and a lower portion 430 of the back rest frame 426 to move or slide generally horizontally (as indicated by the arrow labeled 433).

10 In one embodiment, the seat pan frame 424 and back rest frame 426 are secured to the base 422 through a roller, pin or the like 440 mounted within a track 442. The roller rolls along the track as a force is applied to seat pan 424 and/or back rest 426 shifting the position of 15 the seat pan and lower portion 430 of the back rest along the track 442. The track 442 limits the movement of the seat pan and back rest.

The seat additionally includes a pivot arm 450. The pivot arm is pivotably fixed at one end to the base 422. 20 The other end of the pivot arm 450 is secured with the seat pan frame 424. In some embodiments, the pivot arm is rotationally secured with a proximal end of the front portion of the seat pan frame positioned proximate the rear portion of the seat pan frame. The pivot arm aids in 25 maintaining the position of the seat pan and back rest, and avoiding inadvertent shifts between up-right and reclined positions. The pivot arm 450 is configured with sufficient length such that a slight lifting force is employed to effect a shift and thus prevents inadvertent shifts from an 30 up-right position to the recline position and vice versa.

A user applies a forward force as well as a lifting

force (for example, by applying a force on the upper portion 432 of the back rest). The up-ward force allows the seat pan to lift at the point 436 where secured with the pivot arm (e.g., at the junction between a front 5 portion 452 and a rear portion 454 of the seat pan frame) allowing the pivot arm to swing forward. As the seat pan moves forward the pivot arm 450 continues to pivot pushing the front portion 452 of the seat pan. The front portion of the seat pan rolls over a peg, roller or other device 10 456 as it is pushed forward. Once the majority of the length of the front portion of the seat pan extends beyond the roller 456, the front portion begins to swing down out of alignment with the rear portion 454 of the seat pan.

Once the front portion 452 drops down out of 15 alignment, the rear portion 454 continues forward to a maximum forward and reclined position limited by the track 442. The lower portion 430 of the back rest frame 426 also continues forward, reclining the back rest until the roller 440 reaches the end of the track 442. The pivot arm 450 provides similar functionality for returning the seat from 20 a reclined position to the up right position. The user again provides a lifting as well as a rearward force to allow the pivot arm to swing back over vertical as the seat pan roller 440 travels through the track 442.

In one embodiment, the upper portion 432 of the back rest includes an upper back rest slide/pivot point 460. The upper slide/pivot point 460 maintains the position of the back rest while allowing the lower portion 430 to swing out as the seat pan is shifted forward establishing the 25 reclined position. In one embodiment, the upper slide/pivot point 460 is secured within a track 462. The

track allows the back rest to swing forward to establish the reclined position while the lower portion of the back rest 430 is moved forward when the seat pan 424 is moved forward.

5         The seat can be assembled by moveably securing the track 442 with the base 422. The seat pan frame 424 and back rest frame 426 can then be secured with the track 442. The pivot arm 450 can be pivotably secured with the base 422 and the seat pan frame 424. The upper portion 432 of  
10         the back rest frame 426 is further secured with the base 422. As described above and in reference to FIG. 5, the base can include the base portion 262 and a back portion 264, where the back portion 264 is pivotably secured with the base portion 262. Further, the front portion of the  
15         seat pan frame can be pivotably secured with the pivot arm or the rear portion of the seat pan frame.

In an alternative embodiment, the seat pan 122 and lower portion 132 of the back rest are hydraulically controlled. A piston, pulley system or other similar  
20         mechanism is fixed to the seat pan 122 and frame 136. The user depresses a button or other activation device to release the piston. With the button depressed the user can apply a forward force to the seat pan and/or a backwards force to the upper portion of the back rest to slide the  
25         seat pan forward to a desired position. Once in the desired position, the user releases the button to secure the piston and thus the seat pan. The user can shift to other positions or return to the up-right position by depressing the button and applying backward pressure to the  
30         seat pan and/or lower portion of the back rest.

With previous seats if a person is sitting in front

of a wall, bulk-head or other structure the seat cannot recline because there is no space for the seat back rest to move.

Alternatively, the present invention allows a person  
5 sitting in front of a wall, bulk-head or other structure to recline his/her seat because the seat pan and lower part of the back rest moves forward away from the wall. As such, the person can still recline.

In one embodiment, the seat 120 is further  
10 configured to allow the back rest to additionally recline into the space of the person behind to an extent similar to that seen in previous seats. In this embodiment, not only does the seat pan and lower portion of the back rest shift forward and the front portion of the seat pan drops down,  
15 the back rest can tilt back. This allows the person sitting in the seat to achieve an even greater reclined position providing more comfort and more possible positions.

One or more cushions of the back rest can be  
20 configured as a flotation device. As such, the user can remove the portion of the back rest in emergency situations.

While the invention herein disclosed has been described by means of specific embodiments and applications thereof, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope of the invention set forth in the claims.